

# Autonomous Surface Site Establishment to Ensure Safe Crew Arrival and Operations

Completed Technology Project (2017 - 2018)



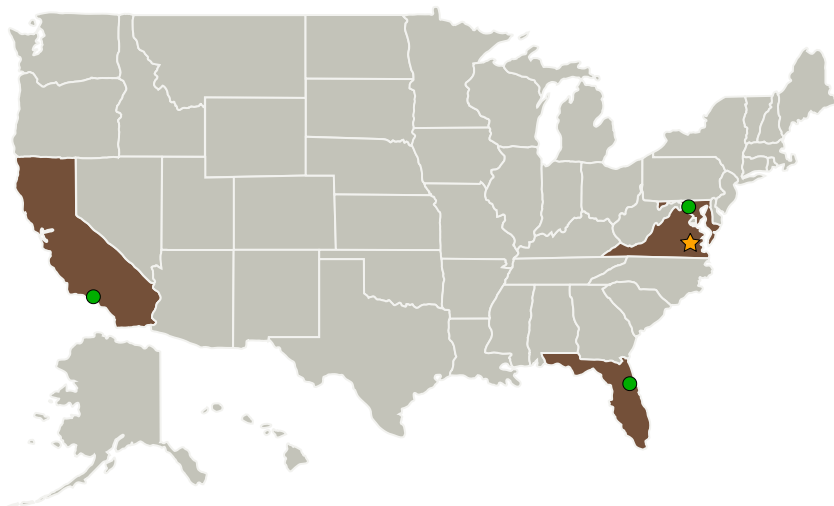
## Project Introduction

Identify the surface assets and the autonomous operations necessary to provide an operational and safe destination that reduces risk for human Mars exploration. 1) Traditional Mars surface strategies have relied on crew availability to support system setup and repair 2) Safety first, then crew has been followed throughout history of human spaceflight (e.g. Apollo, crew to low Earth orbit) #Advances in autonomy and associated technologies on Earth are applicable to the deployment and operations of Mars surface infrastructure, leading to a safer destination when crew arrive.

## Anticipated Benefits

This work benefits human exploration for the moon and mars

## Primary U.S. Work Locations and Key Partners



Autonomous Surface Site  
Establishment to Ensure Safe  
Crew Arrival and Operations

## Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Project Website:	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

# Autonomous Surface Site Establishment to Ensure Safe Crew Arrival and Operations

Completed Technology Project (2017 - 2018)



Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
California	Florida
Maryland	Virginia

## Project Transitions

▶ **October 2017:** Project Start

✓ **September 2018:** Closed out

**Closeout Summary:** Developed novel human Mars surface architecture that addresses risks associated with traditional approaches to Mars missions. Developed surface habitation concept that reduces risk while support redundancy and expandability to future larger crews. Identified enabling autonomous capabilities to support architecture subject of future CIF-IRAD study (Infrastructure Construction using Mars Resources in support of a Safe Initial Human Mars Settlement). Identified concept of operations for surface build-up related to future CIF-IRAD study (Reusable, Aeroassisted Orbit Transfer Vehicle Development that Mitigates Mars Transportation System Risks).

## Project Website:

[https://www.nasa.gov/directorates/spacetech/innovation\\_fund/index.html#.VC](https://www.nasa.gov/directorates/spacetech/innovation_fund/index.html#.VC)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Langley Research Center (LaRC)

### Responsible Program:

Center Innovation Fund: LaRC CIF

## Project Management

### Program Director:

Michael R Lapointe

### Program Manager:

Julie A Williams-byrd

### Principal Investigator:

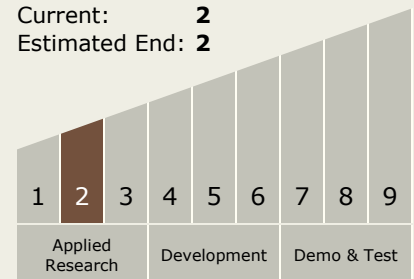
Christopher P Jones

## Technology Maturity (TRL)

Start: 2

Current: 2

Estimated End: 2



# Autonomous Surface Site Establishment to Ensure Safe Crew Arrival and Operations

Completed Technology Project (2017 - 2018)



## Technology Areas

### Primary:

- TX07 Exploration Destination Systems
  - └ TX07.3 Mission Operations and Safety
    - └ TX07.3.2 Integrated Flight Operations Systems

## Target Destinations

The Moon, Mars